Compressed Air

DEVOTED TO THE USEFUL APPLICATION OF COMPRESSED AIR.

VOL. V. NEW YORK, JUNE, 1900. No. 4

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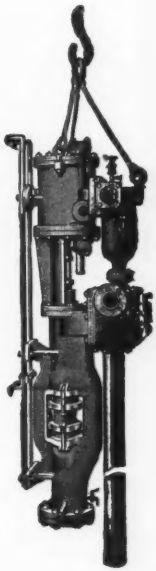

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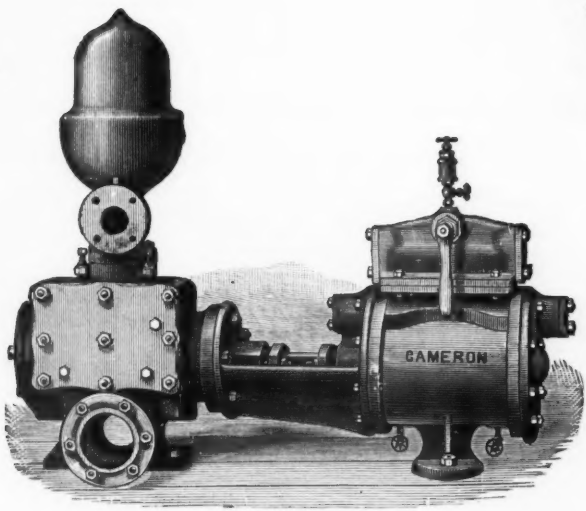

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Compressed Air.

A MONTHLY PUBLICATION DEVOTED TO THE USEFUL APPLICATION OF COMPRESSED AIR.

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We have been asked from time to time to express our opinion on liquid air, its usefulness, its commercial value, and whether or not we recommend persons taking stock in the several liquid air companies which have been organized. The province of this paper has been to publish in its columns descriptions of liquid air generating apparatus and various interesting experiments made with this extraordinary substance. We have also published opinions, ideas and theories on the subject, because we believe that liquid air being now an accomplished fact should be understood and the various ideas and suggestions agitated so that out of so many things we may be directed to some thing practical. Thus far we simply know that liquid air may be produced in large quantities by an air compressor and an expansion installation, and that the cost of producing it has been considerably reduced during the past year or two When produced its properties establish its identity, and through its extremely low temperature we have been able to perform certain interesting experiments, which are in some cases valuable, from a scientific point of view; but it does not follow that liquid air is going to do what its promoters have proclaimed.

We are by no means sure that it is going to make money in the present generation, and yet we would not be surprised to learn that some one has found a practical application in its use. Such application, in fact, as may yet give it a commercial value.

Things that are new and of great value to mankind are slow in reaching practical results. A period of 75 years elapsed after the discovery of the electric arc before electric lighting reached a point when it became commercially valuable. Magneto electricity was brought to a point of great interest in science, and yet it was not until 50 years afterwards that dynamos and electric motors were used. The industry of refrigeration is now a large one, made commercially useful because of the liquefaction of ammonia gas, and yet ice was first made artificially in 1851 at Apalachicola, Florida, by Dr. Gorrie, and by means of compressed air.

We may say at present that liquid air is simply a substance of great scientific interest, yet it would be quite unwise to prophesy what the future may or may not bring forth. This very uncertainty has unfortunately been worked upon by promoters of schemes to sell stock. The fact that some remarkable results are being accomplished with this substance and its great novelty, are used for building up an easy foundation for the smart promoter who has issued stock and sold it on nothing but possibilities. The promoter is always attracted to things theatrical, and wins greater success in such a field than on lines of common, safe business practices. It is simply necessary to make a demonstration of liquid air and prepare some wonderful experiments to make it pay, because the public is not scientific or technical and falls readily into surprise and error in the great possibility of a thing, which is so new and mysterious It is a "get rich quick crowd" which falls into such a trap as this, and we are glad to say that in our judgment such schemes can only flourish in a short period of time The reaction will surely come, and liquid air will remain as it is, simply a scientific experiment of great interest and value Over all this there is a possibility of some good coming out of it. There are so many men at work upon it seeking to grind something out of it, that it is but natural to expect results if it be within the limits of possibility.

Compressed Air Machinery

A Self-Propelling Air-Hoist, with Unlimited Travel.

Following are the description and illustrations of a novel and remarkable traveling air-hoist which cannot fail to excite the interest of shop readers. It is a complete air hoist, which travels as far as the overhead rail extends in either direction, going around curves, or switching to other lines, as required, with a constant connection with the air supply, all under the control of the operator, who rides with it. It is, however, not necessary for an operator to ride with the trolley, as it can be made to travel between points, starting and stopping automatically. In that case the hoist and motor are operated by pendants from the floor. The motor and the hoist, wherever they may be along the line, are both always in full connection with the air supply, and without any hose to look after or any outside connection.

The means by which the air supply is conveyed to the trolley and the connection constantly maintained will be understood from Fig. 2 (not shown). Along the runway of I beams is suspended a feed pipe of cold-drawn steel tube, and this is covered by a thin steel casing, which normally is closed, but which is capable of springing apart at the bottom. The air tubes are in 8-foot lengths, and are joined together by couplings which form a bearing for a valve in each with the valve operating mechanism. The couplings and the pipe have a true and uniform continuous surface externally. Surrounding the air pipe is a flexible receiver of such diameter as to allow a given area between the outer wall of the feed pipe and the inner wall of the receiver. The receiver travels with the trolley, and connection is made to the trolley through a hollow arm which is a part of the receiver and extends down through the slot in the casing. The lengths of the feed pipe being 8 feet 6 inches from center to center of valves, the length of the receiver is 9 feet, so that one valve is always open inside the receiver. The ends of the receiver fit the outside of the feed pipe with self-packing stuffing boxes. These ends, externally, are made conical, so that as the receiver passes along the pipe the conical surfaces raise the tappets attached to the valve levers. The conical mouth of the receiver raises the tappet, and a longitudinal rib within the receiver keeps the tappet up until it emerges at the other end of the receiver. When both tappets of either lever are up the valve connected with the middle of the lever is raised, and when the tappet drops the air valve is closed again. Supposing the receiver to be moving to the left, the right-hand valve is seen to be open, and the first tappet of the left-hand valve lever has been raised. When the second tappet is reached and raised, the left-hand air valve will be open, and almost immediately, if the movement of the trolley and receiver continues, the right-hand valve will close, and thus the valves will be opened successively and the pressure in the receiver will be maintained.

Fig. 3, showing the trolley and motor, requires little explanation here. The motor is of the three-cylinder type. With the pressure applied to the outer ends only of the cylinder the trolley can attain a speed of 400 feet per minute, if necessary. The motor runs at such a speed as to develop all the power required to move the trolley with its heaviest loads; the motor shaft carries a small pinion which connects with the largest gear, and small gears on the same shaft connect with intermediate gears that mesh into gears on

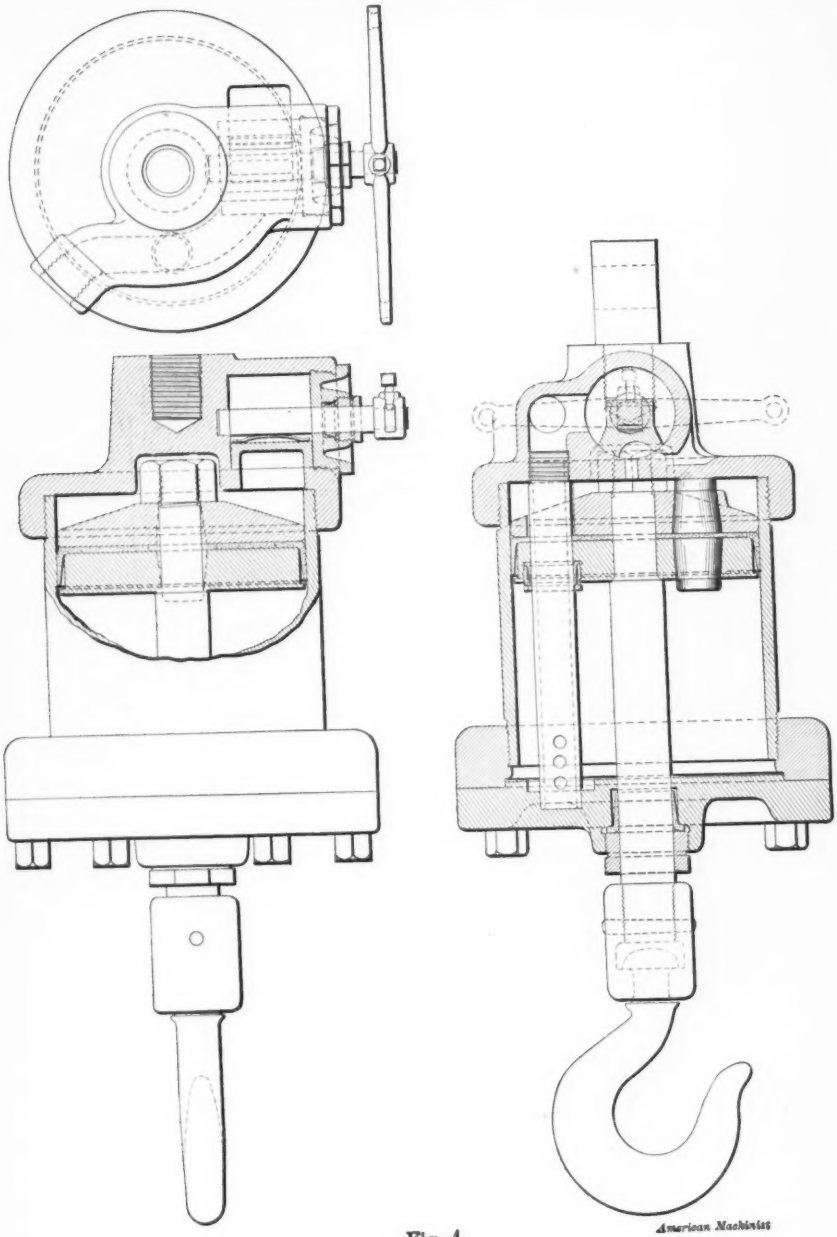


Fig. 4

DETAILS OF AIR HOIST.

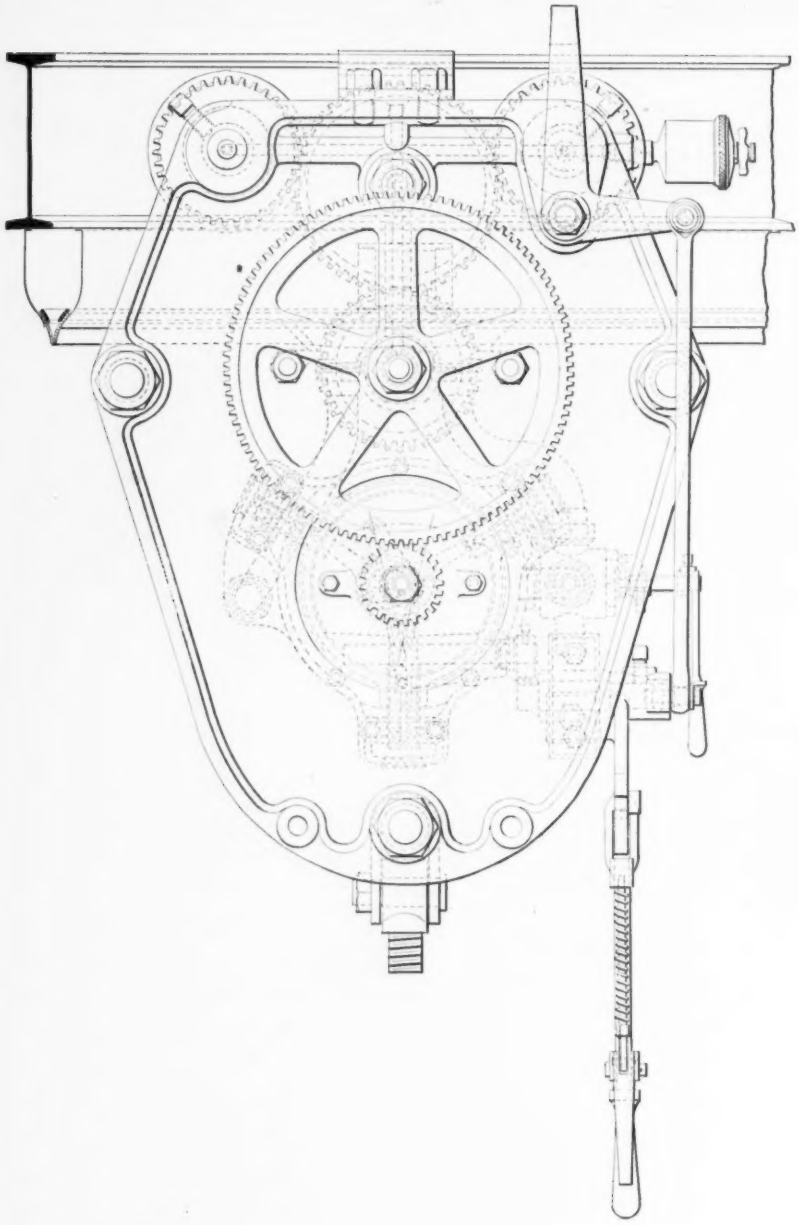
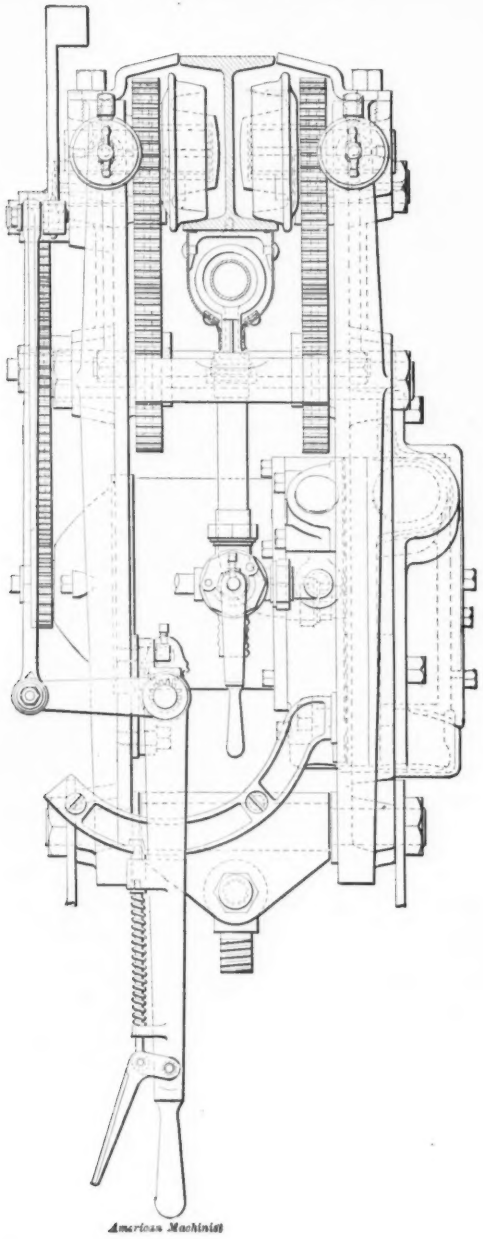


Fig. 3

TROLLEY AND MOTOR.



TROLLEY AND MOTOR.

wheels on both sides of the trolley. Levers for reversing and for the throttle are provided. After the air has done its work in the motor, instead of allowing it to exhaust into the atmosphere, it is led through another hollow arm back into the casing, which naturally creates a stronger air pressure flowing from within the casing than the atmospheric pressure without, thus preventing the possibility of dust settling on the feed pipe and valves. This exhaust air at the same time carries oil in the form of spray from the motor, which serves to keep the feed pipe well lubricated.

At switching points the pipe casing and beam are broken in order to shift the main track to the switch track. The switch ends of the feed pipes are plugged, and the air supply is led to the other ends of the pipes.

The hoist, Fig. 4, has some original features. In air hoists, as usually operated, the air for hoisting is admitted under the piston, and when the load is to be lowered this air is discharged into the atmosphere, the weight of the load being sufficient to bring it down, although when there is no load the weight of the piston and rod is not always sufficient except for very slow movements. The usual air hoist, therefore, normally has no air pressure upon either side of the piston. In the present hoist there is full air pressure upon both sides of the piston, except when hoisting. The air pressure is conveyed to the lower side of the piston by means of the vertical pipe seen within the cylinder. The upper end of this pipe is in constant communication with the air supply, and the lower end of it in as constant communication with the lower end of the cylinder. There is a stuffing box in the piston where this pipe passes through it. The piston also has on both sides of it a wooden block, which serves as a buffer and prevents the shock of metal to metal when the piston touches either end of the cylinder. No operating valve is connected to the lower end of the cylinder. When a load is to be hoisted the pressure is released from the upper side of the piston and the hoist ascends. For lowering, the pressure is readmitted above the piston. When the pressure is on both sides of the piston there is an unbalanced pressure downward equal to the area of the piston rod below, and this differential pressure operates in addition to the weight of the parts to cause the piston to descend. This apparatus is made by the Pneumatic Crane Company, Pittsburg, Pa.—American Machinist.

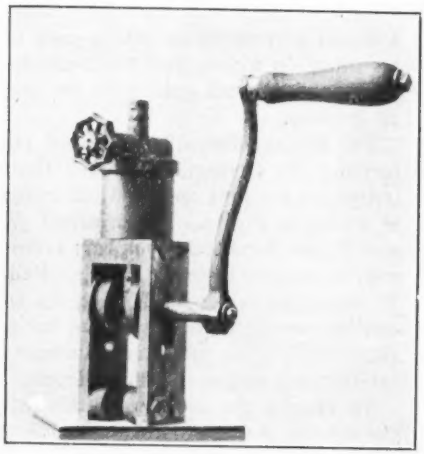
Machine for Fitting Vehicle Springs.

A novel machine for the fitting of vehicle, locomotive and car springs, also other springs of similar construction, has been patented by A. A. Landon, formerly with the Kalamazoo Spring and Axle Co., Kalamazoo, Mich.

This tool is operated by compressed air by means of a hose connection and a 3-way valve, and an ingenious arrangement of rollers connected to the end of piston rod and on frame of machine. In operation, after the two plates have been put together over the "Jack" pin on fitting horse, the machine is engaged by slipping plates through lower opening of frame and turning to an upright position; the air being turned on, the upper wheels engage the hot plate on top and lower wheels the under side of cold plate, in practically the same manner as in hand fitting. The crank, or handle, is then revolved causing the machine to travel over every part of the hot plate, causing the hot plate to take in every sweep and curve of the cold plate in a more perfect manner than can be done by hand. It has the advantage of not necessitating the changing of the spring fitting horse or tempering tub, but is used in connection with same, it being only necessary

to bring an air pipe down over the tub. A peculiar feature of the spring business is that it is impossible to make a stock of goods ahead, very nearly all orders differing in some respects.

The advantage of this machine over the old style spring fitting machine is that it needs no adjustment and is always ready to fit an order of any size, it not being necessary to adjust same as with the old style machine, it pinches the two plates together in the same way as hand fitting, and is adapted to any width of a



MACHINE FOR FITTING VEHICLE SPRINGS.

spring. A small order can be fitted in the time necessary to set the old style machine and will give a correspondingly better economy on large orders and when operated in connection with the main plate bent in backbending machine will make a saving of from 30 to 50 per cent. over hand fitting on vehicle springs and should do better than 50 per cent. on locomotive or other heavy springs. It is operated by unskilled labor and is adapted to either oil or water temper, and is at present in successful operation in one of our largest spring shops.

This machine marks the introduction of compressed air in the spring industry, and we are certain it will lead to the use of compressed air appliances in the more progressive concerns of the country.

Mr. A. A. Landon is at present connected with the American Radiator Co., manager of the Titusville Plant, Titusville, Pa., and will gladly give any further information that may be desired by interested parties.

Signaling and Switching

Low-Pressure Pneumatic Interlocking at Jersey City.

As heretofore noticed in the Railroad Gazette, the Erie Railroad has lately installed at Grove Street, Jersey City, about half a mile from the terminal passenger station, an interlocking plant made by the Standard Railroad Signal Co., of Troy, N. Y., in which all of the switches and signals are worked and controlled by compressed air. The system is that of the Pneumatic Railroad Signal Co., of Rochester, whose plant on the New York Central, at Buffalo, N. Y., was described in the Railroad Gazette of July 8, 1898. The Standard Company is now the sole licensee for this country under the patents of the Pneumatic Company.

The accompanying drawing, Fig. 1, shows the arrangement of the tracks, switches and signals at the Jersey City plant. There is a large freight yard on the north as well as on the south side of the main line, so that across the two main passenger tracks (indicated in the drawing by the words "east" and "west" at this point) there are large numbers of freight and switching movements.

The interlocking machine has 59 working levers and five spare spaces. The design of this machine has been considerably modified since the publication of our

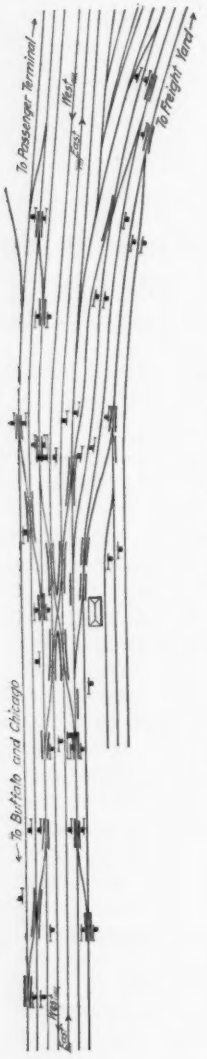


FIG. 1.—GROVE STREET, JERSEY CITY—ERIE RAILROAD.

former description. A view of one of the machines—not that at Grove St., but one substantially similar in appearance—is shown in Fig. 2. The principal features of the system are the same as those which were shown in connection with the Buffalo machine. No electrical apparatus is used; the working air pressure is 15 lbs. per square inch; the pressure in the operating and indicating pipes is 7 lbs. per square inch, and these latter pipes are normally under atmospheric pressure only —that is to say, at all times except when a movement is to be made or an indication is to be given. The final portion of the stroke of the lever is automatic, so that as soon as the signalman has pulled a lever to initiate a switch movement or a signal movement, he can at once turn his attention to the next lever which he has to pull, without waiting for the return air-impulse.

The arrangement of valves and pipes forming the connection between the interlocking machine and a switch cylinder is shown in Fig. 3. The principal parts are: S, switch rails; s1, lock bar; s, switch rod; M, motion plate; C, switch cylinder; D, indicating valve; R2, R3, R4, R5, controlling valves; L, L2, operating bar and slide valve; I, I2, indicator cylinders; H, interlocking tappet; X, air reservoir.

To change the position of the switch the signalman grasps L by the handle and pulls it out. In doing this he admits air (from the main supply through the valve L2) through pipe a to valve R5, which opens communication from the supply pipe X to the right-hand end of cylinder C, pushing the piston to the left. Observing now the slots L and M, it will be noted that after about one-half of the stroke of L has been completed it is stopped by the piston rod of I2; but the operation of valve R5, already accomplished, causes M to move through the whole of its stroke. This stroke of M is uninterrupted, but we may consider it in three parts. The first part, say one-third, does not move the switch, but valve D is moved far enough to close the two

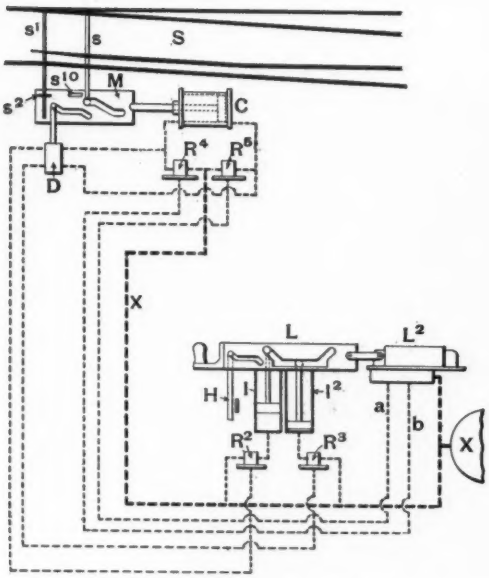


FIG. 3.—SWITCH MOVEMENT.

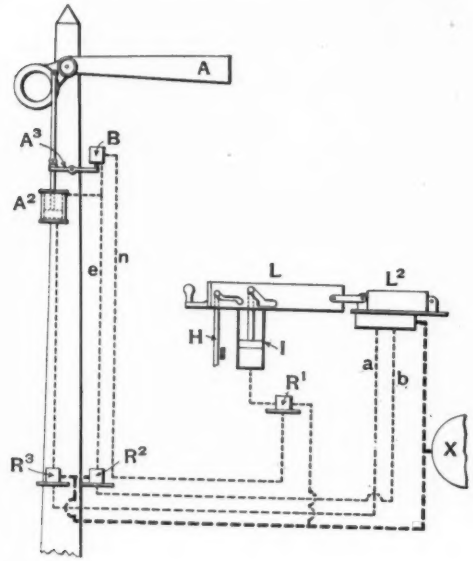


FIG. 4.—SIGNAL MOVEMENT.

pipes on its right, while those on its left are open to the atmosphere. At the same time lock bar s1 has been liberated at s2. As M moves through the next or middle portion of its stroke, it moves the switch; but it now produces no effect on valve D, because the rod of D is now engaged by the straight portion of its slot in plate M. The switch being set, the third and final part of the stroke of M locks the switch by pushing s10 through a hole in s1; and also (but not until after s10 has entered its hole) the plate changes valve D so as to connect together the two pipes at its lower end. This conveys pressure from the supply through R5 and D to valve R3, which valve the admits air from the supply to I2, forcing the piston rod upward, and, by means of the diagonal portion of the slot in bar L, forcing this bar to complete its stroke. This return action takes place at ordinary distances in from one to three seconds.

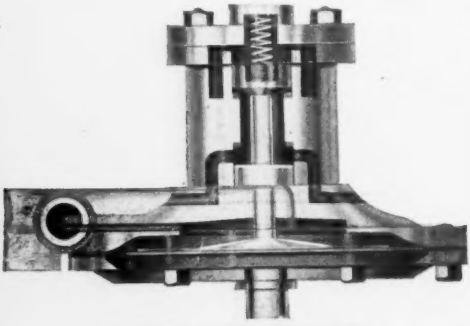


FIG. 5.—DIAPHRAGM VALVE.

By the action of L2 pipe a is now opened to the atmosphere. Valve R5 is now released from pressure, and R4 is closed; so that the right-hand pipe to cylinder C and its connection to and through D are open to the atmosphere. All four operating pipes are now at atmospheric pressure.

By the movement of L, tappet H has been moved so as to produce the proper mechanical locking of conflicting levers (in the first part of the stroke of L) and the proper unlocking (in the last part of this stroke) in the same manner and sequence that the same interlocking would be effected in a mechanical interlocking machine.

To move the switch back to its original position, the opposite set of pipes is used. The bar L is pushed to the right; air through b actuates R4, and the return indication to the cabin actuates R2 and lifts the piston in I.

To work a signal, valves and operating pipes are used of the same general style as those for a switch, but there is only one indicating valve and one indicating cylinder, as it is unnecessary to assure the attendant that a signal is in the go-ahead position. The signal connections are shown in Fig. 4. The principal parts are: A, signal arm; A2, signal cylinder; A3, lever to work indicating valve; B, indicating valve; R2 and R3, diaphragm valves, controlling the admission of air to the top and bottom, respectively, of the signal cylinder; R1, diaphragm valve controlling admission of air to cylinder I. The signal being in the normal or danger position, the indicating valve B is in a position to maintain a connection between the two pipes attached to it; but the instant the signal arm leaves the horizontal position the valve shuts off this connection.

To change the signal the signalman pulls L to the left, the whole length of its stroke. By this movement L2, admitting air to pipe a, actuates valve R3, which supplies air to the lower end of cylinder A2 and pushes up the piston, putting the signal in the inclined or all-clear position. The air impulse is transmitted so quickly that at the average distance—say 500 ft. and less—the movement of the signal is practically simultaneous with the movement of the lever. The signal remains in the inclined position as long as L is pulled to the left. To restore it to the normal or

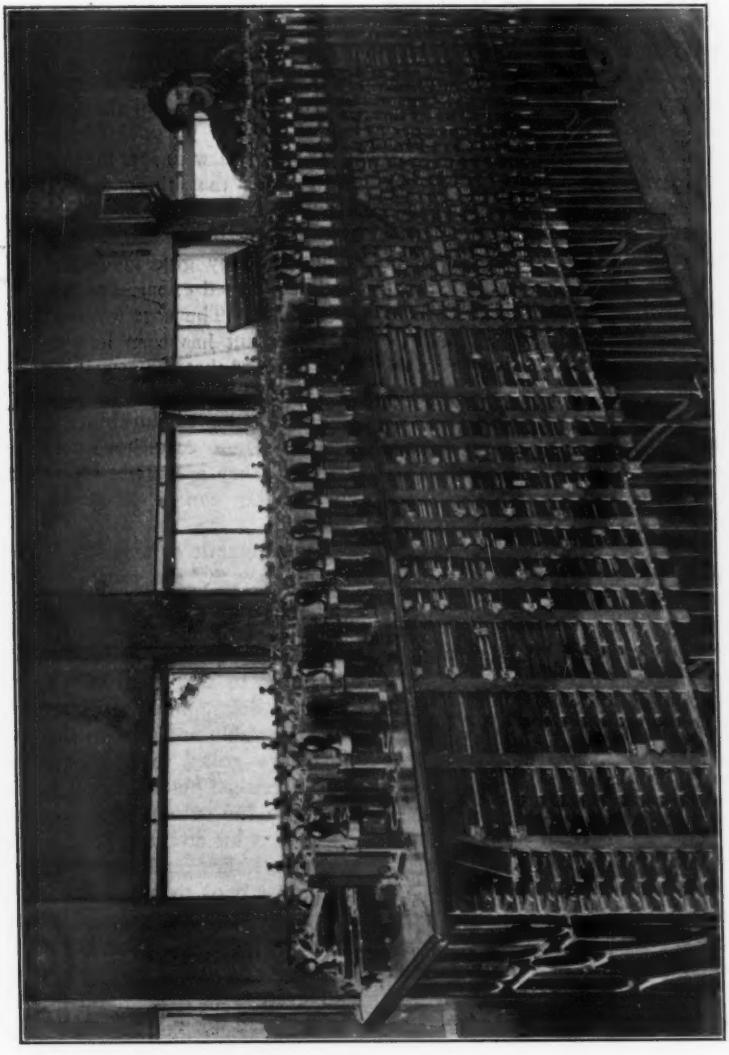


FIG. 2.—LOW-PRESSURE PNEUMATIC INTERLOCKING MACHINE.

stop position, L_1 is pushed to the right until it is stopped by the piston rod of I (at the end of the horizontal part of the slot in L_1). With L_1 in this position, pipe b is charged and valve R_2 is opened. The passage between pipes e and n (through B) is now closed, so that the opening of R_2 admits air from the supply to the upper end of A_2. This restores the signal to the horizontal position, and by means of A_3 opens valve B. Air now passes from e through b and n to R_1, and the latter causes air to enter I and complete the return stroke of L_1 by the action of the piston rod on the diagonal part of the slot. Pipes b, e and n are now at atmospheric pressure, and the parts are in the same position as at the beginning.

In Fig. 5 is shown the diaphragm valve, which is called the "relay," its function being similar to that of an electromagnetic relay in electrical apparatus. This valve is actuated by air at 7 lbs. pressure. This pressure, admitted beneath the circular rubber diaphragm 8 in. in diameter, pushes up the cylindrical valve, placed vertically in the upper part of the case, and thereby liberates air at 15 lbs. per square inch to move the piston in the switch or signal cylinder. The movement of the diaphragm is only ¼ in.

The low-pressure pneumatic interlocking machine is made up of three principal elements: (1) A row of slide valves (called "levers"), like that shown in outline at L_1 and L_2, Figs. 3 and 4. The only physical labor imposed on the signalman is that involved in pulling out and pushing in these valves. (2) A mechanical interlocking frame placed vertically on the front of the machine. This is of the common mechanical type, like the Saxby & Farmer or the Johnson, but with the parts made about half the usual size. The manner of connecting the "lever" with the interlocking is indicated by the position and arrangement of the tappet H in Fig. 3. (3) The indicating cylinders and their relays on each "lever," as shown in Figs. 3 and 4.

The operating and indicating pipes extending to the switches and signals are ½ in. in diameter. The supply pipes from the air reservoirs are larger, the size being varied according to the number of switches and signals to be supplied.

The air is first run through a cooling frame for the purpose of precipitating moisture; but with low pressure the company finds that there is practically no trouble from moisture in the pipes.

Both the manufacturers and the railroad company give favorable reports of their continued experience with the plant at Buffalo. The cost for repair material at that plant has been less than $4, and it is believed that the wearing parts of the machine have been so well designed that the maximum of durability can be expected. These parts have very light service and they are made interchangeable, so that they can be quickly and cheaply renewed.

The automatic completion of the stroke of the lever by the return indication is found to be a decided convenience in a busy yard. Where a signalman, after making the first half of the stroke of a lever, has to wait for the return indication, the delay, though very short, is yet an appreciable addition to his cares, for he delays going to another lever until he has finished his duty with the first one. But with the automatic movement he at once turns his attention to the next lever and thus stands ready (waiting perhaps a second or two) to move that as soon as it shall be freed by the interlocking. Any failure of the automatic movement would, of course, prevent a liberation of the second lever, as the locking bar or bars holding it would not release it unless the preceding lever completed its stroke.

The Standard Railroad Signal Co. has now under construction six low-pressure plants, as follows: For the New York

Central & Hudson River R. R. Co., a 96-lever machine at Suspension Bridge, N. Y., a 48-lever machine at Hoffman, N. Y, and a 176-lever machine at the Grand Central Station, New York City; for the Chicago & Western Indiana at Chicago, a 40-lever and a 48-lever machine; and at the Grand Central Depot, Chicago, an 80-lever machine for the Chicago Transfer & Terminal Railroad.—Railroad Gazette.

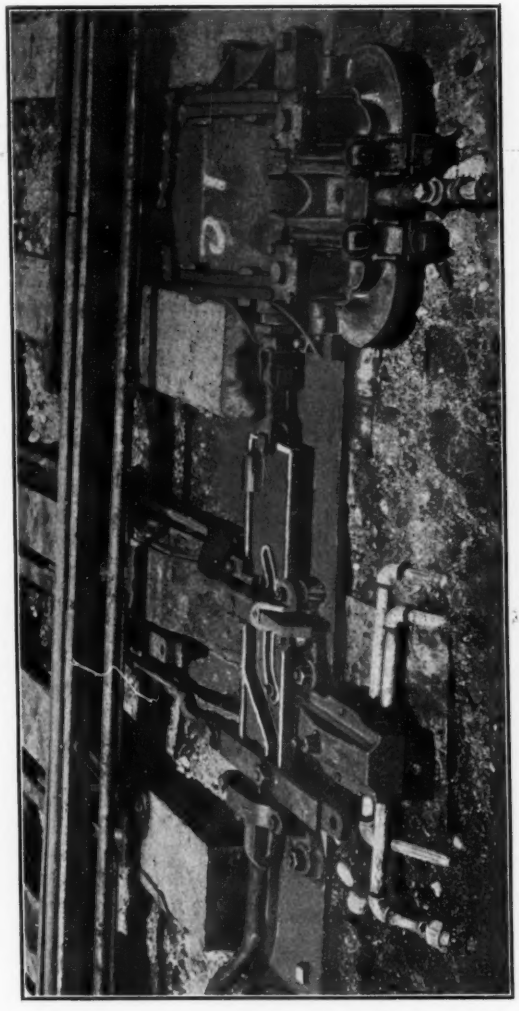


FIG. 6.—SWITCH MOVEMENT.

Air Jets

A combined compressed air churn and butter worker has been invented by Mr. R. R. Stone, a butter dealer of New York. The churn itself is wooden, cylinder shaped, like a barrel, and in it are revolving paddles, which are worked by a crank, either by hand or power. Legs support the cylinder and make it stationary, and consequently can be well ventilated. The churn is open at the top. Air is compressed and cooled, then conveyed through a small copper tube with small perforations through the bottom of the churn and escaping at the top, permeating all parts of the cream. Because of the cooling properties of compressed air no ice is required, even in warm climates. Churning may be commenced with warm cream and cooled as rapidly as desired. By the thorough distribution of cold, streaks in the butter are avoided.

The manager of the company now playing "Quo Vadis" at the New York Theatre proposes to give a trial to liquid air for cooling the auditorium during performances, and that fact is attracting a great deal of attention. There is no apparatus made for the pupose, and the liquid air companies are at work upon the problem. There is no doubt as to the cooling properties of liquid air, and it is claimed that the oxygen which would be imparted to the atmosphere would enrich it and add to the comfort of those present.

Prof. Raoul Pictet and Mr. Moriz Burger, both of whom are connected with the General Liquid Air and Refrigerating Co., New York, read papers before the Franklin Institute, Philadelphia. It treated of "Recent improvements in the manufacture of liquid air; the separation of air into its constituent parts, and the industrial use of oxygen, nitrogen and carbon dioxide."

On Wednesday, May 16th last, Prof. Charles E. Tripler, the inventor and investigator of liquid air, went to Europe and will attend the Paris Exposition.

The use of hoists and elevators in printing offices is well demonstrated in the New York Herald printing office.

A line of air supply pipe is located between each two presses, and near this pipe is suspended a trolley for cylinder hoists of the Nason type. Heavy rolls of paper are raised to the presses and placed in position for printing. The press then prints and folds the papers, and they are passed to pneumatic elevators and raised to the countingroom in a car similar to the ordinary dumb waiter.

The New York Air Compressor Co. has received, through the Chicago Pneumatic Tool Co., an order for a compound steam driven compressor, to furnish 1,500 cubic feet of air per minute for the motive power department of the New York Central & Hudson River Railroad.

The Compressor Company is also building a large compressor to be placed in the Grand Central Station for the operation of pneumatic signals.

The New York Central Railroad Co. has placed an order for pneumatic riveters and drills with the Q. & C. Co., and will use them in their work of strengthening bridges on the West Shore line and elsewhere.

The Empire Engine and Motor Co., Orangeburg, N. Y., report the demand for Empire air tools and hoists is exceptionally large. Shipments of Empire hoists, drills and centre grinders were made last month to four different United States navy yards.

The Pedrick & Ayer Co. has just issued a new catalogue of 126 pages, illustrating the standard special railroad appliances of which they have been makers for many years. Some new tools are shown in their Compound Locomotive Cylinder Boring Bars and special Corliss Valve Seat Boring Bars. This catalogue shows a very complete line of pneumatic hoists, vertical and horizontal, with necessary appliances, as well as jib and traveling cranes, which are illustrated, together with some interesting installations of same.

Especial attention is given to the improved pneumatic riveting machines which the Pedrick & Ayer Co. build.

It is only recently that this concern has gone extensively into the market on Riveters, but they are now prepared to furnish them of any special design of frame, from portable machines for light work up to the heaviest stationary riveters for large boiler work, and cover a line of structural designs, including hinged riveters for intercostal work on vessels, where it is next to impossible to get at the rivets to drive them by hand.

A decided change in the ratings of the company's machines is noticed in the new catalogue, which gives the total effective pressure exerted on a rivet, with various sizes of standard frames, ranging from 43,000 lbs. to 188,000 lbs. exerted pressure on the rivet; also the length of the final effective stroke which carries the maximum pressure. Whether the rivet be 2½ inches or 8 inches in length, the construction of the machine takes up the difference instantly, without any adjustment, and then admits of so much effective stroke.

Copies of the catalogue, we are informed, may be obtained free upon application at the sole selling offices of the company, 85-87-89 Liberty street, New York.

The Philadelphia Pneumatic Tool Co. reports a rapidly increasing demand for their tools. Their chipping and calking hammers seem to be particularly in demand, large orders having recently been received from the Pennsylvania Steel Co., Baldwin Locomotive Works, Brown & Sharpe Mfg. Co., Ingersoll-Sergeant Drill Co., The Bigelow Co. and many other representative concerns. In all cases their hammers were adopted after severe competitive tests.

This company has been obliged to more than double the capacity of their shops since the first of January. They have established agencies in all the leading cities of Europe, and also in Japan.

PATENTS GRANTED APRIL, 1900.

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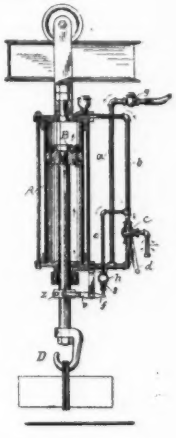
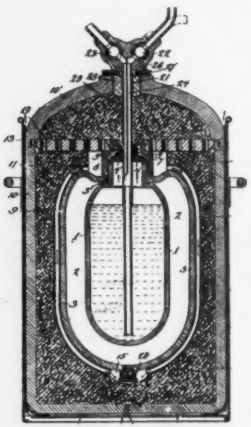
646,458.—PNEUMATIC HOISTING APPARATUS. Howard A. Pedrick, Philadelphia, Pa., assignor to The Pedrick & Ayer Company, same place. Filed April 24, 1899.



The combination with the cylinder, piston and piston-rod of a pneumatic hoist having a motive-fluid-supply pipe communicating with one end of the cylinder, and a branch pipe communicating with the opposite end of the cylinder, whereby the motive fluid is admitted to both sides of the piston and an equilibrium of pressure established, of a valve interposed in the passage between the respective ends of the cylinder for exhausting the fluid from the upper end of the cylinder to the atmosphere and from the lower end of the cylinder to its upper end, to operate the piston in either direction.

646,459.—PORTABLE VESSEL OR BOTTLE FOR HOLDING AND SHIPPING LIQUID AIR OR OTHER LIQUID GASES. James F. Place, Glen Ridge, N. J.

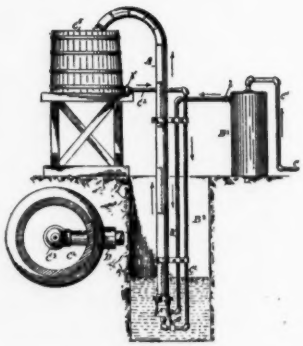
In a vessel for holding liquid air or other liquid gases, the combination of a liquid-holding bottle having a vacuum or partial-vacuum insulating-space, inclosed by an air-tight case, immediately surrounding said bottle; a series of refrigerating downward air-passages, and a series of refrigerating upward air-passages surrounding said air-tight case; and an outside case or wall of wood fiber, or other



material of low heat conductivity, fixed between said upward and said downward refrigerating air-passages, and surrounding or inclosing said liquid-holding bottle.

646,640.—AIR LIFT-PUMP. George H. Evans, Oroville, Cal., assignor of one-half to the Risdon Iron and Locomotive Works, San Francisco, Cal. Filed Jan. 26, 1899.

An air lift-pump, the combination with a discharge or column pipe having an inlet-opening in its base, and a series of air-jet openings above the inlet-opening, means for forcing air through the jet-openings, a tank above the pump and into which the pipe discharges, and a hydraulic



water-supply pipe leading from the tank to the base of the column-pipe having an upturned nozzle on its lower end arranged in line with the interior of the column-pipe for the purpose specified.

646,740.—SAND-BLAST FOR SURFACING METAL, GLASS, &c. William H. King, Newark, N. J. Filed Sept. 14, 1899.

An improved sand-blast, comprising a box having a hopper-shaped bottom having, at the low center thereof, an out-passage for sand formed in the tubular extension e, a pipe f, having an enlarged head coupled to said tubular extension, said pipe f, below said extension, being turned aside from the vertical line of said extension and arranged at an incline, an air-injector g, connecting with the turned or inclined part of said pipe f, and a rubber hose attached to said pipe at a point distant from vertical line of the extension e, in the line of the injector g, said hose extending upward and entering the box above the hopper-shaped bottom and at its free end, being adapted to be turned to direct the sand against any portion of the article to be ornamented.

646,892.—PNEUMATIC BELT-SHIFTING MECHANISM. Jesse Woodberry, Boston, Mass. Filed Feb. 10, 1900.

A bellows or collapsible air-reservoir of an organ, of a motor belt-shifting device, a pair of bellows or pneumatics connected with and adapted to actuate the belt-shifting device in opposite directions and interposed between the latter and the air-reservoir, a valve mechanism for controlling the operation of said pneumatics, and suitable connections between the air-reservoir and the valve mechanism, whereby the latter is operated automatically by the expansion and collapse of the air-reservoir, substantially as described.

647,246.—PNEUMATIC SPRING. James C. Anderson, Highland Park, Ill. Filed Sept. 16, 1899.

A spring composed of a hollow box or casing open at one end and a reciprocating piston, each adapted to be secured in place relatively to each other, in combination with a rubber body interposed between the head of the casing and the head of the

piston, and composed of a solid head and foot, and a series of independent interior longitudinal air-cells inflated with highly-compressed air.

647,002.—CAPSULE FOR COMPRESSED OR LIQUEFIED GASES. Heinrich Korrodi, Berne, Switzerland. Filed July 11, 1899.

A capsule for compressed or liquefied gases, comprising an inner cover and an outer vented cover, in combination with a cap having a perforator mounted on the inside of the end of the cap, said cap adapted to fit on the capsule with its perforator projecting through said aperture in the outer cover and penetrating said inner cover.

647,265.—PNEUMATIC DRILL. John A. Hoff, St. Louis, Mo., assignor of two-thirds to Edmund F. Wickham and Alfred Bevis, same place.

A valve-casing having a central chamber and ports arranged on each side thereof, of a valve passing through said ports and chamber, a V-shaped groove in said valve, which is wholly within the chamber when the valve is in its central position, and a valve for admitting pressure to said chamber which is actuated by the inclined faces of said groove.

647,415.—PNEUMATIC TOOL. Julius Keller, Philadelphia, Pa., assignor to the Keller Tool Company, same place.

A pneumatic tool with a valve for controlling ports common thereto and to a hammer, and consisting of a hollow shell or cylinder, the interior surface thereof being always open to fluid pressure, said valve being located exteriorly to said hammer in alinement therewith, and adapted to move in the same direction as the latter.

647,416.—PNEUMATIC RAMMER. Julius Keller, Philadelphia, Pa., assignor to the Keller Tool Company of Pennsylvania.

A pneumatic rammer, the combination of a cylinder having a nosepiece, through which the piston passes, a rammer connecting the said piston-rod, a piston, an auxiliary valve connected to said piston, an auxiliary valve case located within said cylinder and having ports therein adapted to aline with the necks of said auxiliary valve, and a main valve for controlling the

movement of said piston, said main valve being actuated by the passage of fluid through said ports.

647,455.—PNEUMATIC DRILL. Edward C. Meissner, St. Louis, Mo., assignor to the Standard Railway Equipment Company, East St. Louis, Ill. Filed May 15, 1899.

The combination with a casing and a spindle fixed therein and provided with inlet and exhaust ports, cylinders mounted on said spindle, pistons in said cylinders, a crank-shaft with which said pistons engage, a plug mounted on the end of the spindle, and provided with ports in registration with the inlet and exhaust ports of said spindle, and a rotary valve co-operating with said plug to control the admission of pressure to, and exhaust from the spindle ports.

647,514.—LIQUEFACTION OF AIR. Oscar P. Ostergren, New York, N. Y., assignor of one-half to Samuel M. Gardenhire, same place. Filed Aug. 26, 1899.

An apparatus for the refrigeration and liquefaction of aeriform fluids, the combination of a counter-current condenser having incoming and outgoing channels, a compressor and cooler connected to the incoming channels, a connection from the outgoing channels to the compression-cylinder of said compressor, a second compressor, a branch from said last-mentioned connection to the power-cylinder of said last-mentioned compressor, a precooler having a plurality of coils, a connection between the exhaust side of said compressor power-cylinder and one end of one of the coils of said precooler, a connection between the opposite end of the said precooler-coil and the compression-cylinder.

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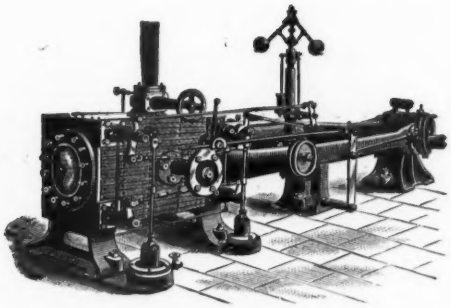
The men forming this Company have no pet theories or pet devices, but desire to go into the market with the best power and machine obtainable, applying it to practical work. They recognize the fact that there are a number of automobile engines in the market now, and that some of them may be developed to do the work planned.

The full development of this industry will not be accomplished by talking. The machines must be put into practical use. This will develop defects for which remedies can be applied.

Arrangements are already made to acquire rights for steam and gas automobiles, and experiments are being made with an air wagon, and this combination is ready to consider any form of engine or power that promises to give the results aimed at.



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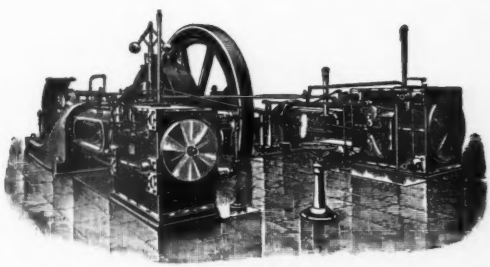

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